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RELATIONSHIP OF THE BLUESTAIN FUNGUS TO SOUTHERN PINE BEETLE OUTBREAK INTENSITY

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INTRODUCTION

The association between the southern pine beetle Dendroctonus frontalis Zimmermann (SPB), and the bluestain fungus, Ceratocystis minor (Hedgcock) Hunt, has long been known. The fungus depends on the insect for dissemination and introduction into susceptible trees. Whether the beetle benefits from the association has not been unequivocally demonstrated. Ceratocystis minor is pathogenic to pines and has been implicated as the primary mortality agent of southern pine beetle-attacked trees. Bluestain infection causes a reduction in moisture content of the tree and may create conditions that favor brood development. However, direct interaction between bluestain and southern pine beetle larvae inhibits beetle development. Where the phloem has been extensively colonized and stained by C. minor, larvae make atypically long galleries and develop poorly. The life cycle is extended, and complete development may never occur.

Ceratocystis minor does not uniformly colonize the tree. In most cases, bluestain is found only in isolated patches. This limited distribution of C. minor may be important for optimal southern pine beetle development because larval development is inhibited in stained phloem.

The purpose of this study was to determine whether the amount of bluestain in SPB-killed trees varied among outbreak versus non-outbreak populations. The goal was to determine the feasibility of using bluestain as a predictor of SPB population trends.

METHODOLOGY

Bluestain was measured in SPB-infested trees in Louisiana during 1984 to 1987. Measurements were taken at a height of 1.5 - 2.0 m in trees containing predominately pupae or callow adults. To measure bluestain, four 100 cm² samples of bark were removed to expose the sapwood. A piece of mylar was placed on the surface of the sapwood and areas containing bluestain were recorded by tracing the stain with a marker. The area of bluestained wood was measured on the mylar in the laboratory using an area-measuring device. The amount of bluestain is reported as the percentage of the sample stained by C. minor.

RESULTS AND DISCUSSION

The mean amount of bluestain in SPB-infested trees varied significantly among years. The lowest amount of bluestain occurred in 1985. This was also the year when the outbreak was most severe in Louisiana. The amount of bluestain in infested trees generally reflected the status of the epidemic. We found less bluestain in SPB-killed trees during outbreak years.

The outbreak became apparent in 1984. The next two years were the worst years in history for SPB in Louisiana. The amount of bluestain almost doubled from 1985 to 1986. Although the number of infestations decreased only slightly in 1986, the infestations were generally smaller, and the total number of infested acres was much fewer. In 1987 the amount of bluestain again increased markedly as the outbreak collapsed.

The data suggest that the amount of bluestain could be a useful indicator of SPB population trends. For example, the increase in bluestain in 1986 compared to that found in 1985 might have been used to predict that the epidemic was beginning to decline.